

Doc, I really love Big Mac's, don't you think you could just give me one of those cholesterol pills?

# Risk Reduction

## ● Lifestyle

### Modification

- Lower lipids
- Lower blood pressure
- Improved cardiovascular function
- Weight reduction
- Increased self-esteem
- Evidence based

## ● Medication

- Lower lipids
- Plaque stabilization
- Reduced coronary artery disease mortality
- Evidence based

# Acute Coronary Syndromes

Capital Conference 2004

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# Cardiovascular Disease

- Leading cause of death in the US
- Over 5 million ER visits for chest pain
- Over 2 million hospitalizations
- Of those admitted:
  - 25% mortality
  - 45% women
  - 60% over age 65
- Annual cost of over \$300 billion

# Objectives

- Delineate the full spectrum of acute coronary syndromes
- Explain the pathophysiology of acute coronary syndromes
- Identify historical, physical exam, laboratory and EKG data that contribute to the diagnosis of an acute coronary syndrome
- Discuss an evidence based management plan and optimal treatment for patients with acute coronary syndromes

# Acute Coronary Syndromes

- Represent a spectrum of ischemic myocardial events that share similar pathophysiology
  - Unstable Angina
  - Non-ST Elevation Myocardial Infarction
  - ST Elevation Myocardial Infarction



# Unstable Angina

- Includes new onset angina, crescendo angina or angina at rest or with minimal exertion
- Caused by a non-occlusive thrombus
- May have non-specific EKG changes
- Normal cardiac enzymes

# Non-ST Elevation Myocardial Infarction

- Symptoms similar to unstable angina
- Sufficient vascular occlusion to result in tissue damage and mild myocardial necrosis
- ST depression and/or T-wave inversion on EKG
- Elevated cardiac enzymes



# ST Elevation Myocardial Infarction

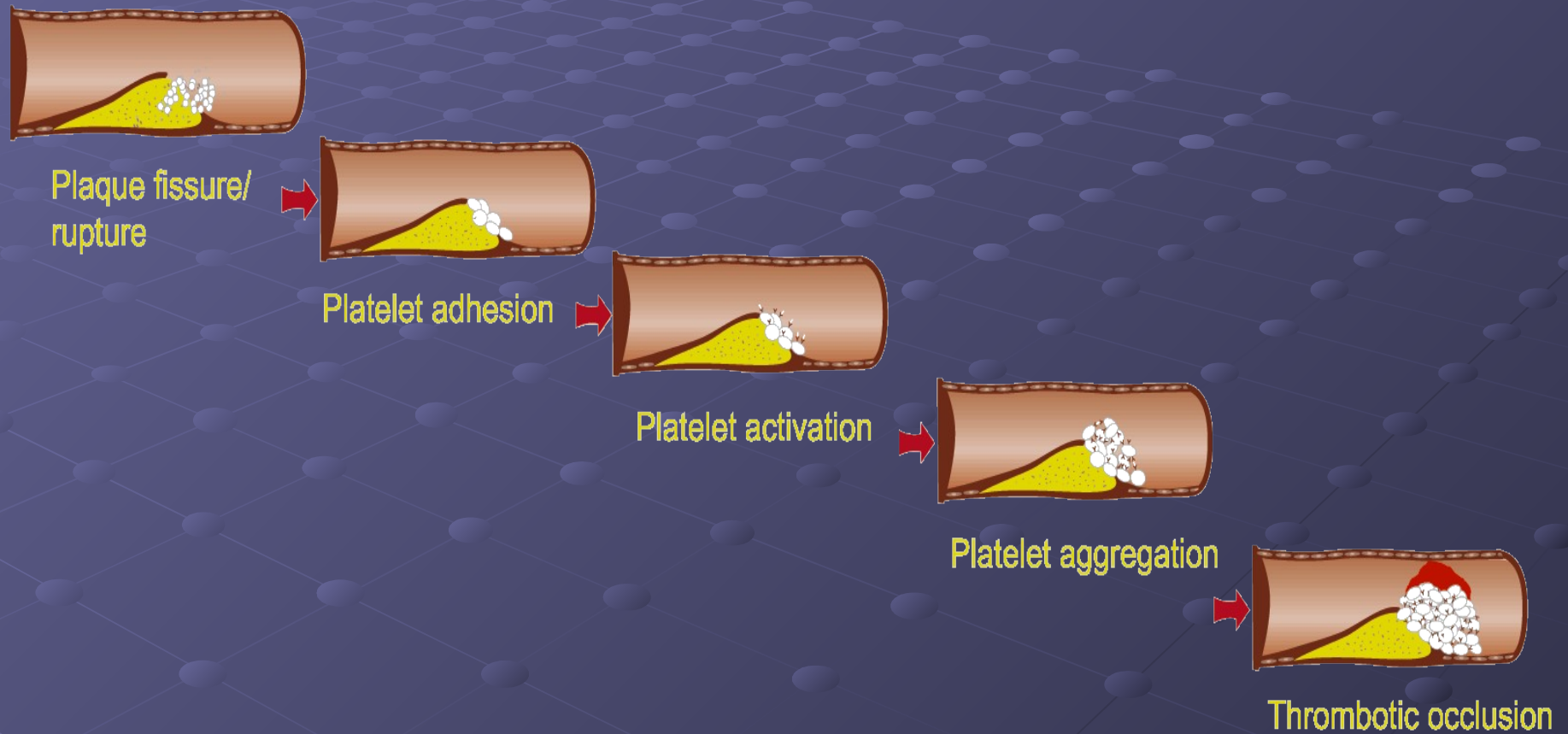
- Symptoms similar to unstable angina
- May have associated severe pain/pressure, shortness of breath, diaphoresis, nausea
- Caused by complete vessel occlusion resulting in myocardial necrosis
- ST elevations on EKG
- Elevated cardiac enzymes

# Pathophysiology Atherosclerotic Plaque

- Lipid-rich core
- Embedded in coronary intima
- Luminal surface with a fibrous cap
- Fibrous cap most vulnerable at its shoulder
- Stability degraded by inflammation, enzymatic processes

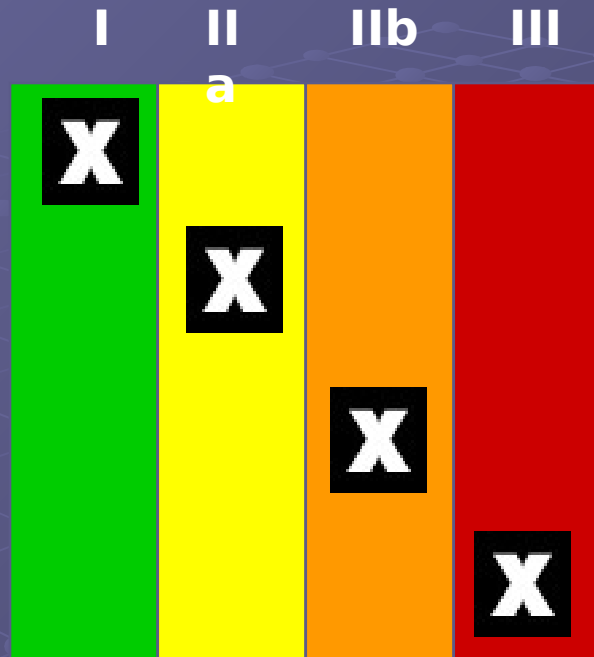


# Pathophysiology



# Evidence

## ACC/AHA Classification of Indications



- Generally agreed to be useful/effective
- Weight of evidence/opinion in favor of efficacy/usefulness
- Efficacy/usefulness less well established by evidence/opinion
- Generally agreed not to be useful/effective and may be harmful

## Updated NSTE ACS Guidelines - Weight of Evidence Grades

**A**

= Data from many large, randomized trials

**B**

= Data from fewer, smaller randomized trials, careful analyses of nonrandomized studies, observational registries

**C**

= Expert consensus

# Evidence

- DOE – Disease Oriented Evidence
- POEM – Patient Oriented Evidence that Matters

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- **DOE** – Disease Oriented Evidence
- **POEM** – Patient Oriented Evidence that Matters
  - Mortality
  - Morbidity

# Evidence

- DOE – Disease Oriented Evidence
- POEM – Patient Oriented Evidence that Matters
  - Mortality
  - Morbidity
    - Re-hospitalization
    - Functional status
    - Chest pain, shortness of breath

# Evidence

- TIMI...(TACTICS...)
- PURSUIT
- ESPRIT
- TARGET
- GUSTO IV
- NICE
- CURE
- ESSENCE
- CARE
- AVERT
- CAPRIE
- ACUTE
- CHAMP
- PRISM-PLUS
- ISIS-4
- L-CAD
- FRISC II
- HOPE
- MIRACL
- VANQWISH

# Risk Stratification

## ● Cardiac Risk Factors

- Hypertension
- Hyperlipidemia
- Diabetes Mellitus
- Tobacco use
- Family History
  - Male < 45
  - Female < 55
- Obesity
- Sedentary lifestyle

# Risk Stratification

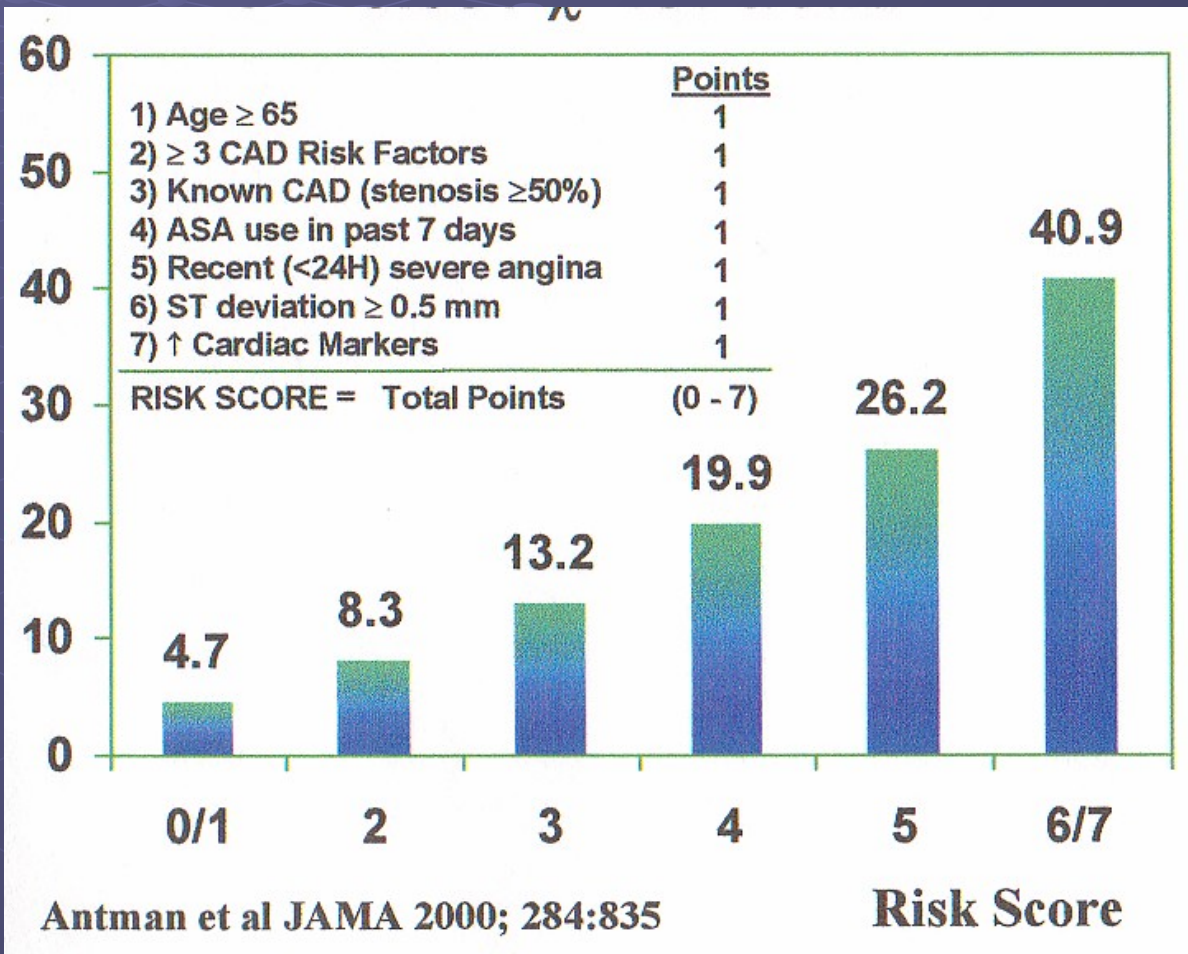
## TIMI Risk Score

Predictor of adverse outcomes in those presenting with  
ACS

- Age > 65
- More than 3 cardiac risk factors
- Prior angiographic coronary obstruction
- ST segment deviation
- More than 2 angina events within the previous 24 hours
- Use of aspirin within previous 7 days
- Elevated cardiac markers



# TIMI Risk Score





# Clinical Data

## History

### ● Characterize symptoms

- Typical angina
  - Substernal chest discomfort of characteristic quality and duration
    - Pressure, squeezing, radiation, diaphoresis, nausea
  - Provoked by emotional stress or exertion
  - Reduced with rest, nitroglycerine
- Atypical angina
  - 2 or fewer of above
- Non-cardiac chest pain
  - 1 or fewer of above

# History

- **P** - Palliative/provocative factors
- **Q** - Quality of discomfort
- **R** - Radiation
- **S** - Symptoms associated with discomfort
- **T** - Timing

# Clinical Data

## Physical Exam

- Measurement of vital signs
  - Blood pressure
  - Pulse
  - Pulse oximetry
  - Temperature
- Focused assessment
  - Cardiovascular system
  - Respiratory system
  - Mental status

# Physical Exam

## ● Increased risk with:

- Hypotension
- Tachycardia
- Pulmonary rales/pulmonary edema
- New murmurs/heart sounds
- Diminished peripheral pulses

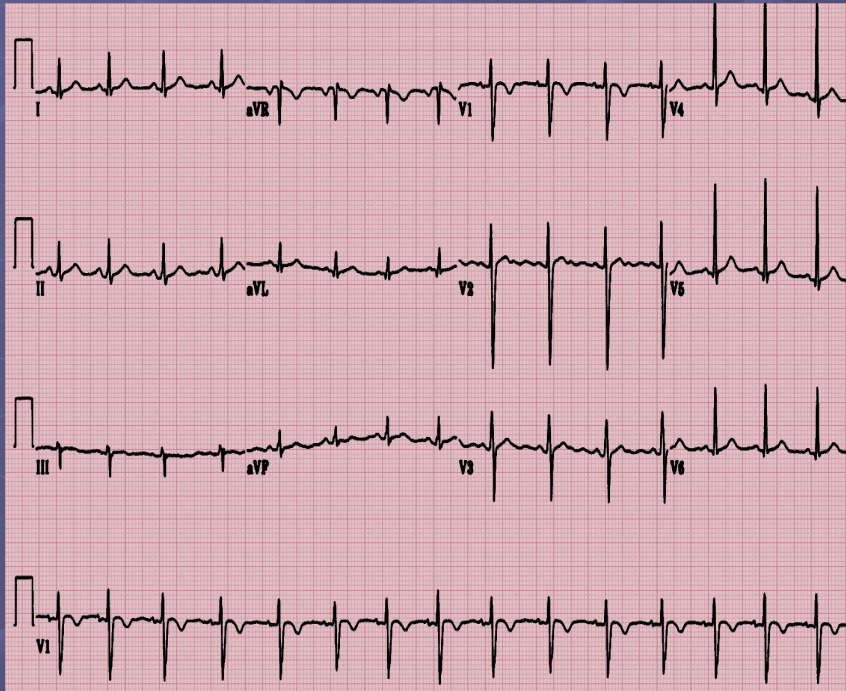
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**Search for non-coronary causes of symptoms**

# Clinical Data

## EKG



● 12-lead EKG should be obtained **WITHIN 10 MINUTES**

- Interpret for:
- T-wave inversions
  - ST depression
  - ST elevation
  - Left bundle branch block

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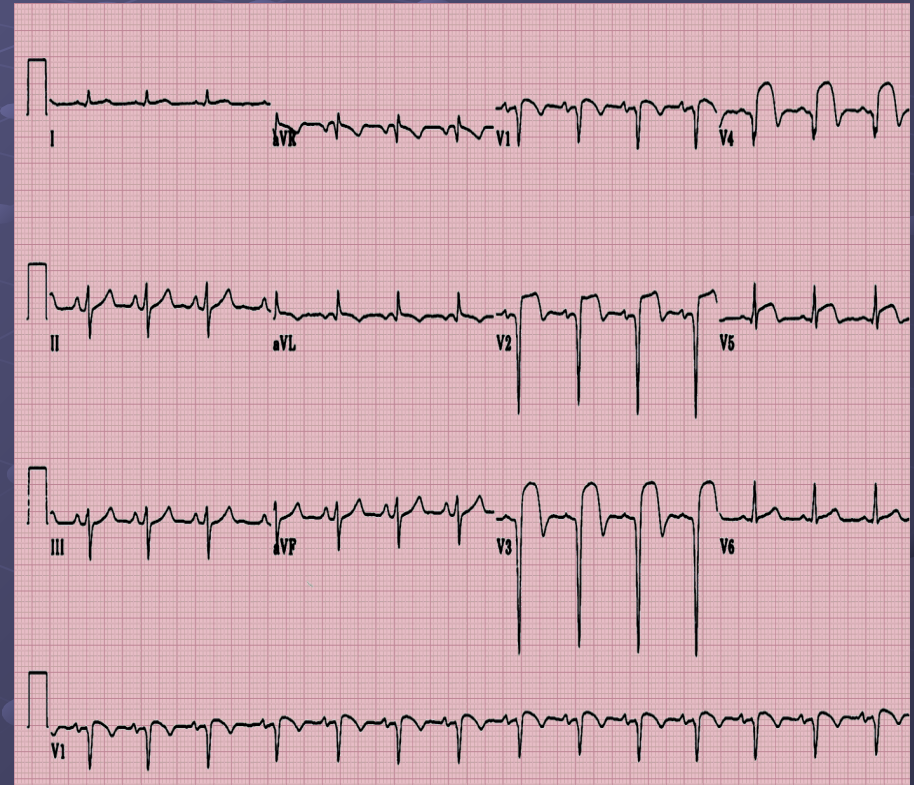
**12 - lead EKG within 10 minutes**



# EKG

## ● ST Elevation

- $> 0.1\text{mV}$  or 2mm
- Present in 2 or more contiguous leads
- EKG change most diagnostic of acute MI
- Increased mortality with increased number of involved leads

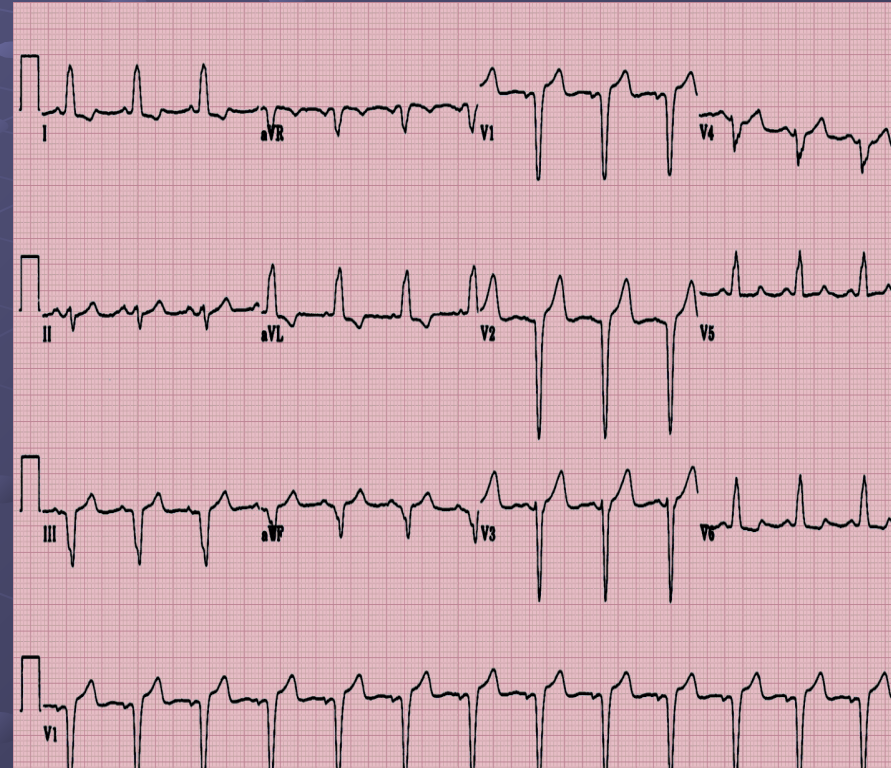




# EKG

## ● Left Bundle Branch Block

- Intraventricular conduction disturbance
- Associated with:
  - Ischemia, HTN, cardiomyopathy
- Obscures accurate interpretation of ST-T segment changes
- Manage like STEMI



# Clinical Data

## Laboratory

### ● Troponin

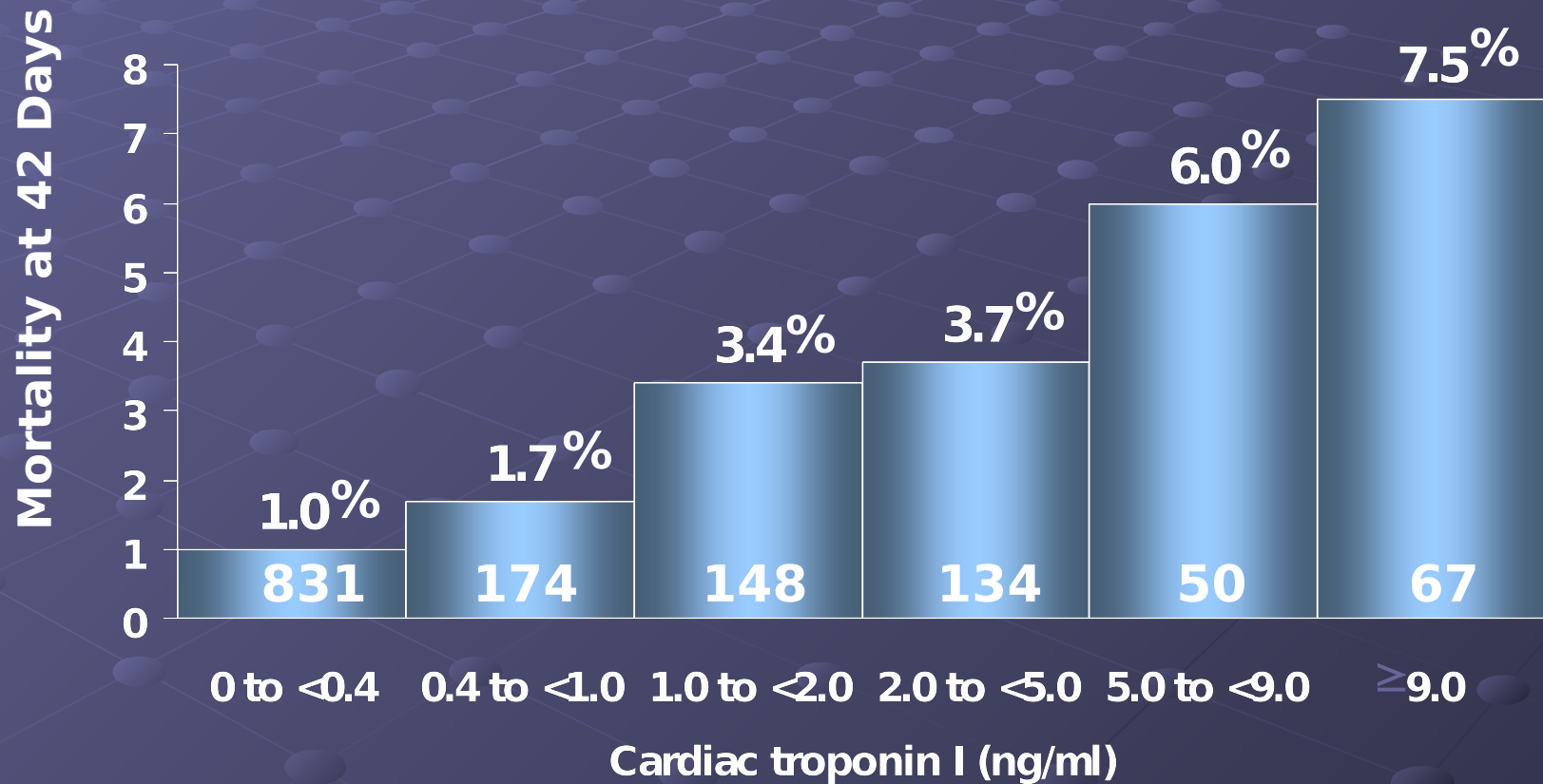
- Very specific
- Detects myocardial necrosis/microinfarction
  - More sensitive than CK
- Begins to rise 4-8 hours after injury
- Remains elevated for 7-10 days
- Provides prognostic information

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**Risk stratification via Troponin I or T**

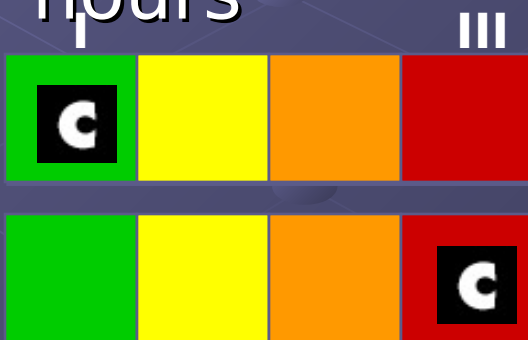
# Laboratory Troponin



# Laboratory

## Creatine Kinase/Creatine Kinase MB Band

- Positive when CK-MB  $> 5\%$  of total CK and/or CK-MB  $> 2$  times normal
  - Begins to rise 4-6 hours after injury and peaks at 24 hours
  - Remains elevated for 36-48 hours
  - CK-MB elevation is predictive of mortality
  - False positives caused by trauma, vigorous exercise, muscle dz, DM, PE
- Risk stratification via CK/CK-MB



Risk stratification via total CK w/o MB

# Laboratory

## ● Myoglobin

- Begins to rise at 2-4 hrs and peaks at 6-12
- Remains elevated for 24-36 hrs
- 25-40% rise over 1-2 hrs strongly suggestive of MI
- Not cardiac specific

## ● CK Isoforms

### ● CK-MB1

- Released w/in 1 hr after MI

### ● CK-MB2

- Begins to rise by 2-4 hrs and peaks at 6-9

- Positive when MB2:MB1 > 1.7

**Risk stratification via Myoglobin or CK Isoforms MB1/MB2**





# A Case

- 54 y.o. male smoker with hx of HTN, HLP
- Presents to your clinic
- 2 week hx of worsening exertional chest pressure, sometimes radiating to left shoulder, mild chest pain now after walk from parking lot



# A Case

- 54 y.o. male with hx of HTN, HLP
- Presents to your clinic
- 2 week hx of worsening exertional chest pressure, sometimes radiating to left shoulder, mild chest pain now after walk from parking lot
- Vital signs
  - BP 152/94
  - Pulse 100
  - Pulse ox 94%
- Exam
  - Lungs – CTA
  - Heart–RRR, no M/G/R
  - Mental status – A&O

# A Case

- Outpatient setting
  - Only 2 % of patients with chest pain ultimately diagnosed w/acute ischemia (12.5% in ER)

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- Only 2 % of patients with chest pain ultimately diagnosed w/acute ischemia (12.5% in ER)
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- Aspirin



# A Case

## ● Outpatient setting

- Only 2 % of patients with chest pain ultimately diagnosed w/acute ischemia (12.5% in ER)
- EKG – within 10 minutes
- Refer, arrange transport
- Aspirin
- Oxygen

# A Case

## ● Outpatient setting

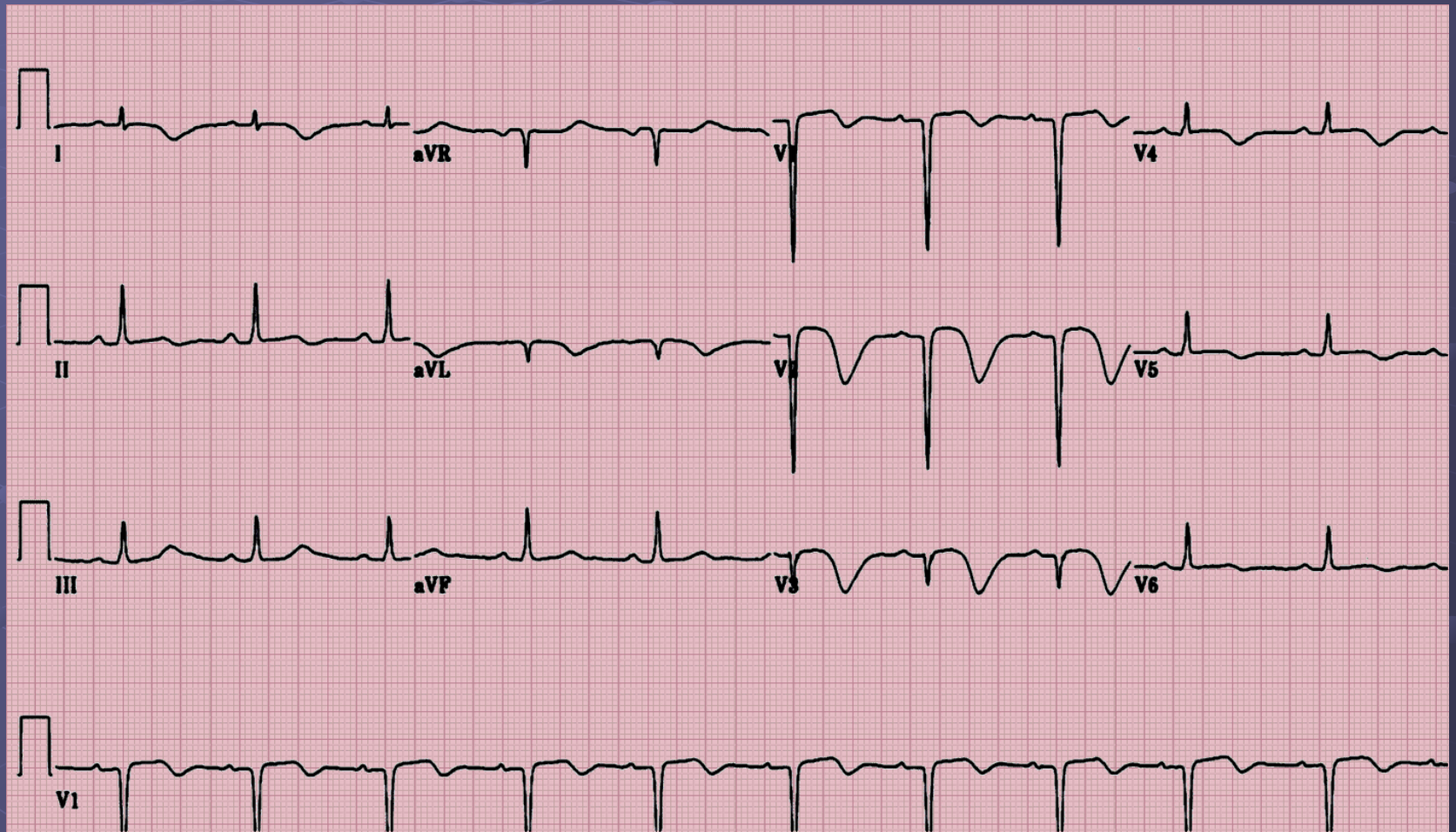
- Only 2 % of patients with chest pain ultimately diagnosed w/acute ischemia (12.5% in ER)
- EKG – within 10 minutes
- Refer, arrange transport
- Aspirin
- Oxygen
- Start IV

# A Case

## ● Outpatient setting

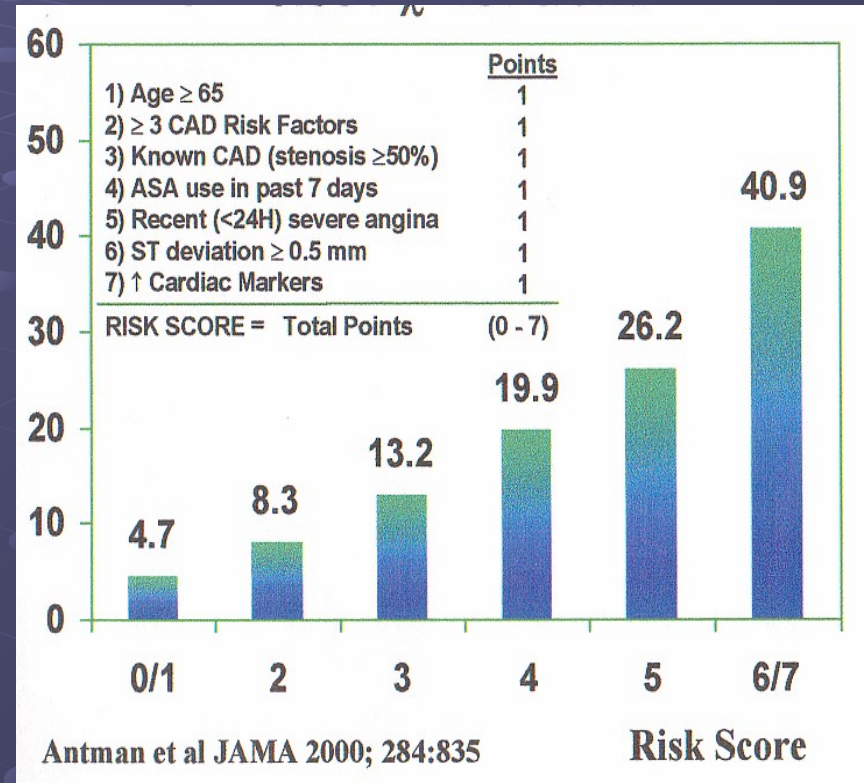
- Only 2 % of patients with chest pain ultimately diagnosed w/acute ischemia (12.5% in ER)
- EKG – within 10 minutes
- Refer, arrange transport
- Aspirin
- Oxygen
- Start IV
- Draw labs

# A Case The EKG



# A Case

- Convincing symptoms
- Positive cardiac risk factors
- EKG changes
- What is his TIMI Risk Score?





# A Case

● What is the diagnosis?

# A Case

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  - Unstable Angina or Non ST Elevation MI
    - Cardiac enzymes confirm the diagnosis

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- What will he need when he sees you for follow-up?

# A Case

- What is the diagnosis?
  - Unstable Angina or Non ST Elevation MI
    - Cardiac enzymes confirm the diagnosis
- What will he need when he sees you for follow-up?
  - Lifestyle modification
  - Review HTN, HLP management
  - Aspirin, Plavix

# Management and Treatment

- Initiation of treatment is time sensitive

- Of MI deaths:
  - 52% are pre-hospital
  - 19% are within first 24 hours
  - 8% are within 24-48%
  - 21% occur within 30 days

- Delay in treatment results from:

- Late presentation
- Prolonged pre-hospital evaluation and transport
- Emergency department



# Management and Treatment

**Indicated for all ACS Patients**

## ● Aspirin

- 160-325mg chewed and swallowed
- Irreversible blockage of platelet aggregation
- Plaque stabilization and arrest of thrombus formation
- Indicated for full spectrum of ACS'
- 23% reduction in mortality for patients with STEMI



**Anti-thrombotic therapy with Aspirin**

# Treatment Indicated for all ACS Patients

## ● Oxygen

- 2-4 liters of 100% oxygen
- May limit ischemic myocardial damage by increasing oxygen delivery



**Supplemental O2 for all ACS patients**



**Supplemental O2 if cyanosis, resp dist, p-ox<9**

## ● Analgesia

- Morphine sulfate at 4-8mg IV
- Reduction of pain/anxiety thus decreasing sympathetic tone, systemic vascular resistance and oxygen demand

**IV Morphine if persistent sx or severe agitation**



# Treatment Indicated for all ACS Patients

## ● Nitrates

- 0.4mcg sub-lingual or spray or IV infusion
- Infusion titrated to keep patient pain-free
- Increase blood flow to the myocardium by dilating the coronary vessels
- Reduce systemic vascular resistance and preload via venous system dilation
- Primary indications are for recurrent ischemia, uncontrolled HTN, acute MI

**NTG, sublingual or spray, followed by IV**



# Treatment Indicated for all ACS Patients

## ● Beta-Blockers

- May administer PO or IV
  - More benefit IV
- Improved survival for NSTEMI and STEMI
  - Greatest benefit when started w/in first 24 hrs



Use of beta-blockers

# Treatment Indicated for all ACS Patients

## ● Heparin

- Important anti-thrombus activity via thrombin de-activation
- Should be used in addition to Aspirin

Heparin, UFH or LMWH, use



- IV UFH or sub-cutaneous LMWH



LMWH use

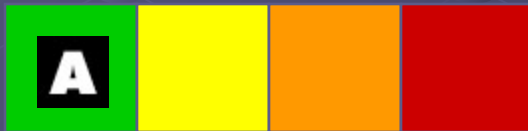


# Management and Treatment

## Newer Medications with Specific Indications

### ● Clopidogrel

- 75mg per day
  - Continue for at least one month after event
- Inhibits platelet aggregation
- Can be used in conjunction with Aspirin, Heparin for UA/NSTEMI if non-interventional approach planned
- Should be stopped 5-7 days prior to



Use of Clopidogrel if ASA sensitivity

Use of ASA and Clopidogrel for 9 mo's after event



# Management and Treatment

## Newer Medications with Specific Indications

### ● Glycoprotein IIb/IIIa Inhibitors

- Inhibit platelet aggregation
- Not indicated for STEMI
- Greatest benefit, in conjunction with Aspirin and Heparin, for those with planned intervention



- May also be beneficial with other high risk features w/out planned intervention



# Management and Treatment

## ● Thrombolytics

- Cornerstone of non-invasive treatment of STEMI
- Should be initiated within 30 minutes of patient presentation
- Not indicated for NSTEMI

# Management and Treatment

## Thrombolytics

### ● Indications

- ST segment elevation  $>1\text{mm}$  in 2 contiguous leads
- New LBBB
- Symptoms consistent with ischemia
- Symptom onset less than 12 hrs prior to presentation

### ● Contraindications

- Previous hemorrhagic CVA
- Known intracranial neoplasm
- Active internal bleeding
- Suspected aortic dissection
- Plus relative contraindications

# Management and Treatment

## Percutaneous Intervention

### ● Limitations

- Operator dependent
- Not universally available

### ● Benefits

- Minimally invasive
- Prompt vessel opening
- Best option for select patients



# Percutaneous Intervention

Recommended treatment for  
UA/NSTEMI in patients with:

- Recurrent angina at rest or w/minimal exertion despite aggressive treatment
- Elevated Troponin
- New ST segment depression
- Recurrent angina with CHF symptoms
- High risk findings on non-invasive stress testing
- Decreased LV function
- Hemodynamic instability
- Sustained V-tach
- Hx of PCI w/in last 6 mo's or prior CABG



# Prevention

- Lifestyle modification

- Dietary counseling

- DASH – Dietary Approaches to Stop Hypertension

- Exercise prescription

- Smoking cessation

- Cardiac rehabilitation

# Prevention

- Health care maintenance

- Routine screening

- Weight

- Blood pressure

- Lipids

- Glucose

- Metabolic Syndrome

# The Family Physician

- Able to tailor treatments and interventions for specific patients
- Able to focus on prevention
- Able to make appropriate health care maintenance and screening recommendations
- Able and willing to focus on lifestyle modifications